Body Builders
From artificial corneas to prosthetic limbs that “feel,” Whiting School engineers are striving to overcome the ravages of injury, disease, and decay.

ALSO: Inside Admissions during “March Madness”
At the Engineering Deans Institute Conference I attended in April, one of the presenters spoke on a subject that is not only of great interest to me, but is at the heart of most discussions regarding the future of engineering in the United States: technical and scientific literacy.

Specifically, how can we encourage elementary through high school students to want to study science, technology, engineering, and mathematics (STEM)? Furthermore, how can we expect students to improve their knowledge in these areas when STEM fields are already underrepresented in our nation’s curricula?

While the number of jobs in the U.S. that require an education in these disciplines has grown at more than four times the rate of the labor force as a whole, we’ve also seen lagging SAT scores and a steady decline in the number of degrees awarded in STEM fields nationwide. At the same time, outsourcing to foreign countries and the need to remain competitive in the global marketplace increase.

As a father and an educator, it strikes me that encouraging our young people to be curious about science and technology is the best way to ensure a new generation of engineers and innovators.

A colleague mentioned to me recently that she’d bet most children’s first exposure to engineering occurs when they read Mike Mulligan and His Steam Shovel. I told her that, sadly, that may also be their last.

It is clear that if we’re to inspire young people to enter STEM fields and create a national pipeline of innovative thinkers, we need to engage students between the time they’re reading about Mike Mulligan and making their college choices.

And to do this, we could use your help. While the Whiting School already offers a number of outreach and mentoring programs to high school students, there’s a lot more we can do to ignite the curiosity of our children and reverse the trend of diminishing interest in STEM careers.

Our alumni and friends are well-positioned to inspire a new generation of young people to become engineers. For example, the next time you consider volunteering in your community, think about judging a science fair or hosting a tour of your workplace for elementary school students. You could speak to middle school students at a career day or provide an internship or summer job to a promising high school student. If you want additional suggestions about how to assist with this effort, please call our alumni office at (410) 516-8723 and they’d be happy to help connect you with opportunities.

We have many dedicated friends and alumni who already help the Whiting School immensely by providing scholarship support and internships and volunteer as ambassadors for the school. With your help, we can help secure not only the school’s strengths but also the future strength of science and technology in our nation.

Many thanks for all that you do.

Sincerely,

Nicholas P. Jones
Dean, Whiting School of Engineering

Dean Nick Jones (center) speaks with undergraduate students and faculty about a student design proposal to create a green roof for Ames Hall (see article p. 7).
DEPARTMENTS

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Bypassing the Mucus Barrier: A “Slick” Answer

Though no one who’s ever been diagnosed with cystic fibrosis has ever been cured of it, new research by Justin Hanes and his colleagues offers a potential solution to one of the biggest obstacles impeding treatment of this devastating and chronic illness.

“The gene that could cure cystic fibrosis has been known since 1989. However, the disease hasn’t been cured because no one knows how to deliver the curative gene to cells lining the airways of the lungs,” says Hanes, an associate professor in the Department of Chemical and Biomolecular Engineering. He adds, “A major change in the next decade will be an increased focus on delivery technologies.”

The way most drugs are delivered now is by flooding the body’s bloodstream with them—an approach that can lead to unwanted side effects or drugs that are too weak for effective treatment. Hanes advocates a more targeted approach. He is at work on an aerosol spray that will deliver drug or therapeutic gene-carrying particles to the lungs, gastrointestinal (GI) tract, female reproductive tract, and more.

The challenge? Getting past the mucus. The sticky and highly viscous substance—which lines the lungs, eyes, GI tract, and female reproductive tract—is proficient at blocking particles from penetrating the body. This is a good thing when those particles are bacteria or viruses, but bad when they are vehicles for life-saving therapies.

So, in his lab, Hanes and fellow researchers are finding ways to get drug-delivering particles past those sticky mucus linings. Most importantly, they’re discovering how to get higher density nanoparticles (those with more “bang for the buck” in terms of drug concentration) through mucus at a faster pace, thereby beating the body’s speedy attempts to flush its contaminated mucus away.

In a paper published this past January in Proceedings of the National Academy of Sciences, Hanes’ team reported that they had found a material coating called PEG that keeps particles from sticking to mucus. PEG had previously been reported as highly adhesive to mucus, but the team showed that PEG molecules with low enough molecular weight (i.e., smaller versions of the molecule) were not.

In one of the most surprising and important findings, the researchers, including first author Samuel K. Lai (PhD candidate in Chemical and Biomolecular Engineering) demonstrated that particles coated with PEG moved through human mucus almost as fast as they move through water; particles without the coating had previously been shown to be completely immobile in human mucus.

The team also reported that openings in the mucus mesh lining are much larger than previously thought. This, in turn, means that much larger particles than previously believed possible have the potential to pass through the protective mucus barrier. Hanes says. Larger particles are desired for commercial products since they are easier to efficiently load with drugs and are capable of sustaining the release of drug molecules for longer periods of time.

“These findings set the stage for a new generation of nanomedicines that can be delivered directly to affected areas to treat a host of important diseases, such as lung, colon, and cervical cancer, asthma, COPD, inflammatory bowel disease, cystic fibrosis, and more,” Hanes notes.

—Angela Roberts

Pomp and Circumstance

- Length of May 17, 2007, undergraduate Arts and Sciences and Whiting School of Engineering commencement: 100 minutes
- Length of film The Graduate: 105 minutes
- Mrs. Robinsons who have spoken at college and university commencements from 2000 to 2007: 6*
- Number of commencement ceremonies at JHU in 2007: 10
- Bachelor’s degrees awarded to the first graduating class of engineers at JHU in 1915: 3
- Bachelor’s degrees awarded by the Whiting School in 2007: 309
- Master’s degrees awarded by the Whiting School in 2007: 873
- Percentage of total master’s degrees that were awarded through WSE’s Engineering Programs for Professionals (EPP) in 2007: 69%
- PhDs awarded by the Whiting School in 2007: 62
- Months it takes JHU’s commencement director, India Lowres, to plan commencement: 10
- Photographs taken by Homewood Photographic Services at all JHU 2007 commencements: 7,786
- Commencement addresses given by members of the Bush family since 2000: 31*
- Commencement addresses given by members of the Clinton family since 2000: 35*
- Most requested speaker (by undergraduates) at JHU in 2007: Jon Stewart
- Number of commencement addresses given by Jon Stewart in 2007: 0
- JHU undergraduate commencement speaker in 2007: Brian Billick, head coach of the Baltimore Ravens

*From the Chronicle of Higher Education Commencement Database
A Vision for Engaging Blind Students

Ben Tang and Caroline McEnnis are on a mission to let young people know that lack of sight is not an obstacle to a career in science. The Hopkins engineering graduate students, under the direction of Materials Science and Engineering assistant professor Michael Yu, have organized a four-day event designed to engage blind high school students in learning about engineering, science, and technology.

The Blind Youth Slam, which will unfold July 31 to August 4 on Hopkins’ Homewood campus, involves 200 blind and low-vision high school students from across the country. The students will be matched with 70 adult mentors from the blind community from a variety of professional backgrounds, as well as students and faculty from the Whiting School, and will participate in a wide range of science and engineering experiments. The projects range from the biological—dissecting a dogfish shark and learning about the circulatory system—to engineering and technology topics, like launching rockets and building windmills.

“People’s knee-jerk reaction is to say, ‘No, that’s not safe,’ but it’s not true. There are ways for blind people to work in science and engineering.”

Braille display computer screens and text-to-speech programs allow blind users to use graphing software, read journal articles, surf the Internet—basically anything a sighted person can do on a computer, she notes. Sometimes, though, blind scientists have to improvise. John Miller, a blind electrical engineer at Rockwell Semiconductor Systems and one of the mentors for the Slam, constructs his own type of poster board that records the impressions made by pens so he can feel graphs and diagrams drawn on it.

McEnnis notes there are many blind professionals like Miller who are making daily contributions to science. Google and NASA are just two examples of high tech organizations that successfully employ blind professionals. “There definitely is a population out there,” she says.

Another goal for the Slam is a social one—giving young blind people a chance to interact with each other. They will stay at the Homewood campus and will be assigned professional aides who can assist them. “A lot of blind students don’t have access to other blind students their age, let alone blind adults who can serve as mentors,” McEnnis says. And, she adds, for many, it will be the first time they’ve been away from home.

Tang and McEnnis hope the Slam will become an annual event. The two also plan on developing curricula to go along with the project that will find its way into high schools where blind students are taught. “Their access to the world is through their hands for the most part,” says McEnnis. The message she hopes they’ll take home? “Get out there and touch the bridge and touch the chair. Experience the world in the way that you can.”

—Mike Price

To find out more about the Blind Youth Slam, go to www.blindscience.org.
Unlocking the Powerful Potential of Stem Cells

When Treena Livingston Arinzeh, MS ’94, was first encouraged by a high school teacher in Cherry Hill, New Jersey to consider a career in engineering, she hardly imagined that she would one day be engineering cures for devastating medical conditions. While most of her peers dreamed of growing up to be doctors and lawyers, professions with which she was familiar, she didn’t really know what engineers do.

With a passion for physics and math, she hit her stride as a mechanical engineering major at Rutgers University. But it wasn’t until her master’s degree in biomedical engineering through the Whiting School’s Part-Time Programs (now Engineering Programs for Professionals) that she began to understand the power of applying engineering principles to medicine, particularly through the use of stem cells. “Here we had these interesting cells and this young field [of stem cell research],” says Arinzeh who went on to earn her PhD at the University of Pennsylvania. “The potential was so huge.”

In the decade since, the 36-year-old (who typically publishes under the name Livingston) has made those remarkable cells the focus of her career. Now an associate professor of biomedical engineering at New Jersey Institute of Technology (NJIT) in Newark, New Jersey, she’s finding ways to use stem cells to repair some of the trickiest tissues in the human body.

After completing her graduate studies, Arinzeh joined Osiris Therapeutics Inc., a Baltimore-based stem cell technology company. There, her research team developed a method to repair bone damaged by trauma or tumors by creating a demineralized bone matrix derived from donor tissue that can act as a scaffold to support bone-building adult stem cells. This product, which received FDA approval, is now available on the market. However, while she enjoyed her work at Osiris, she felt she could “make more of an impact in an academic setting.” In 2001, Arinzeh decided to return to the world of academia, this time as the teacher.

At NJIT, she continued her research in stem cell therapies. To overcome the hurdle of limited availability of donor tissue from cadavers, she set out to develop synthetic biomaterials—using ceramics and polymers—to serve as nano-scaffolds for bone marrow-derived stem cells. Developing a biologically compatible product that could withstand stresses, bear weight, and degrade like real bone was no small feat. What’s more, modifying the surface of the material so that new cells can adhere to the nano-scaffolds presented significant challenges. “You have to coax stem cells to sit on it [the nano-scaffold] and grow into mature cells and new tissue,” she explains.

In a second breakthrough, Arinzeh published a study in the Journal of Bone and Joint Surgery in 2003 showing for the first time that adult stem cells taken from one person could be implanted in another without causing an adverse immune response.

Arinzeh has extended her research to explore using biomaterials and stem cells to repair damaged cartilage—a challenge that presents even more obstacles than repairing bone because cartilage normally doesn’t heal once it tears. And most recently, she has begun to look into scaffolds and stem cell combinations to heal spinal cord injuries—perhaps her toughest challenge yet. “Regenerated neurons need to make all the right connections to restore function,” she explains. Working with a neurosurgeon, her group is investigating biomaterials that may one day be able to guide astoundingly complex nerve extensions.

Arinzeh’s work has earned national attention. Three years ago, she was one of only eight in the country to win the Presidential Early Career Award for Scientists and Engineers. Bestowed at the White House, the honor acknowledged her work, funded by the National Science Foundation, investigating how adult stem cells fundamentally interact with the surfaces of materials.

And even as she pushes the boundaries of her field, Arinzeh maintains space every summer for aspiring scientists from Newark high schools. Working on stem cell projects, they get firsthand experience creating technologies that have the potential to improve human lives.

And they return to school with something Arinzeh did not have in high school—a clear picture of what it is that engineers do.

—Kate Ledger
**Gained in Translation**

A pouch made of nylon mesh sandwiched between two concentric wire stents that could improve cell therapy for diabetics. A thin strip that dissolves in the mouth, like a breath-freshener, that could provide life-saving rotavirus vaccine to infants in developing nations. These are just two of the devices created by Whiting School undergraduates and unveiled on May 2, 2007, at the annual Biomedical Engineering (BME) Design Day.

Also announced that morning was the launch of the new Center for Bioengineering Innovation and Design (CBID). According to Murray Sachs, chair of BME and the new center’s founder, “With CBID, we will be able to double the number of design projects our students do each year and further integrate the design process and technology transfer into the curriculum.

“Our undergraduates have the ability to do all stages of translational research,” says Sachs. “This year alone, eight provisional patents have been filed for devices designed by BME undergraduates. The CBID will allow us to take this strength and push it to the next level.”

The CBID’s structure is quite simple: Clinical faculty from Johns Hopkins, other medical institutions, and industry will be invited to bring real-life medical problems requiring innovative design solutions to the CBID. There, appropriately skilled students, faculty, and researchers will be matched with those clients. The center will offer the structure and technical support necessary for the designs to be realized and commercialized.

CBID will also have an educational thrust—combining undergraduates’ knowledge of biomedical engineering and design with a firm grounding in entrepreneurship, commercialization, and management.

“It’s a visionary translational research center,” says Sachs. “And it will immensely enhance our ability to effectively and efficiently bring the products of student research from the bench, to the bedside, to the marketplace.”

**Putting Heart Disease on the Grid**

In March, the Cardiovascular Research Grid, a worldwide digital data network to be based at the Whiting School’s Institute for Computational Medicine (ICM), was awarded $8.5 million in federal support. The grant, which will be allocated over a four-year period, comes from the National Heart, Lung and Blood Institute, part of the National Institutes of Health. This ambitious project aims to find new ways to prevent, detect, and treat life-threatening cardiac ailments by allowing cardiovascular researchers to easily exchange data and expertise on heart-related illnesses.

With leadership from Johns Hopkins, along with researchers from Ohio State University College of Medicine and the University of California, San Diego, the funding will allow for the development of new software tools that enable large, geographically distributed research teams to connect to the grid. There, all of the participants will be able to access and share experimental data, data analysis tools, and computational models relating to heart function in healthy people and those with cardiac disease.

“There had never been a simple and direct way for cardiovascular researchers to share, analyze, and model this important data,” says the Whiting School’s Raimond Winslow, director of the ICM and principal investigator.

“The creation of the Cardiovascular Research Grid will accelerate the discovery of new approaches for treating heart disease.” The Cardiovascular Research Grid will be headquartered in the Whiting School’s new Computational Science and Engineering building, scheduled for completion this fall.

**Kudos**

Michael Yu, assistant professor in Materials Science and Engineering, received a National Science Foundation Faculty Early Career Development (CAREER) award in March 2007. The CAREER award is given in recognition of young scientists’ commitment to research and education. Yu’s award will fund the exploration of new collagen modification techniques and the development of spatially functionalized collagen scaffolds for controlled microvasculature formation and artificial cornea fabrication. His award will also support the development of a biomaterials laboratory session for blind high school students, including those participating in the Blind Youth Slam, to be held on the Homewood campus this August (see p. 3).

Debbi Donhauser, administrator in the Department of Mechanical Engineering, received the 2007 Whiting School Staff Service Award. The award, given in recognition of Donhauser’s outstanding service in support of the educational and research activities of the Whiting School, was presented at the annual Convocation and Harriet Shriver Rogers Lecture in April.

Donhauser began at Johns Hopkins 17 years ago, arrived at the School of Engineering in 2001, and has been the Department of Mechanical Engineering’s administrator since then. In this role, she has demonstrated tremendous dedication to her job and the school community through her professionalism, volunteer activities, and outreach efforts.
Hopkins and Poly: a Formula for Excellence

Some researchers spend decades trying to get their name on top of a scientific journal article. At 18, Emma Call already has her name on two. Call, who recently graduated from high school at the Baltimore Polytechnic Institute (Poly), was one of 10 winners in the prestigious Intel Science Talent Search for her work completed in the lab of David Gracias, an assistant professor of Chemical and Biomolecular Engineering at the Whiting School.

The annual competition, sponsored by Intel and dubbed the “Junior Nobel” because five winners have gone on to earn Nobel Prizes, recognizes the scientific achievements of high school students from across the nation. This year, Call was the only finalist from Maryland. The finalists attended a gala in Washington, D.C. in March, where Call learned she had placed 10th overall and was the highest placing student in the engineering category.

This year’s competition marked the third year in a row that a student from Poly, working with a faculty mentor from the Whiting School, was a finalist. In 2006, Poly senior Abe Davis earned seventh place for research conducted in the lab of then-Whiting School faculty member Jonathan Cohen. The year before that, Ryan Harrison achieved fifth place honors for work he did in collaboration with Jeff Gray, assistant professor of Chemical and Biomolecular Engineering. Harrison went on to enroll at the Whiting School as part of Johns Hopkins’ first group of Baltimore Scholars; he recently completed his sophomore year.

Through the Ingenuity Project, which aims to prepare highly motivated Poly students to succeed at nationally competitive levels in math and science, Call began working with her Hopkins faculty mentor before entering the Intel competition. Gray, who volunteers on Ingenuity’s Board of Directors, also contributes to the competition preparations. “We had all three of these students present their posters to students, staff, and faculty here on campus before going to the D.C. competition, and they even did mock panel interviews with faculty volunteers here,” he notes.

Call was recognized for her research in developing a new method to make nano-sized boxes in Gracias’ lab (see Johns Hopkins Engineer magazine, Summer 2006). These nano-cubes, smaller than a speck of dust, have the potential to deliver cells or drugs to targeted areas of the body. But making these boxes is difficult; engineering at such a small scale usually only takes place in two dimensions. So Gracias’ lab took an origami-based approach: the researchers built 2-D shapes that could then be folded into 3-D boxes.

Originally, Gracias used solder to connect the cubes at their hinges. But solder has to be melted at 450 degrees Celsius (842 degrees F). Because most biological materials cannot survive at that temperature, the cubes would have to be cooled before they could be filled—a difficult and time-consuming process, Gracias says. It would be much easier and more efficient if the drugs or cells could be put into the cube before it was folded.

Call suggested using polymer, which binds with objects at a biologically-friendly 45 degrees Celsius, instead of solder. The idea intrigued Gracias, so he and Call looked for a way to implement it. After months of trial and error, Call finally developed a working technique. As a result, her name appears as a co-author of two articles—one in Langmuir, published by the American Chemical Society, the other in Angewandte Chemie, published by the Society of German Chemists—describing the technique.

The nano-cubes that employ Call’s method aren’t ready for clinical application yet, says Gracias, but they demonstrate that his lab’s approach is a viable strategy.

Call, whose Intel finish earned her a $1,000 cash prize, a $20,000 scholarship, and a new laptop, plans to study medicine and biochemistry at Case Western Reserve University in Cleveland and hopes to one day practice medicine.

Gray is optimistic that other Poly students will continue in the footsteps of Call, Davis, and Harrison by conducting award-winning research at Hopkins. “There are currently four Ingenuity students in labs here, with more to come this summer,” he says, adding that there are another eight non-Ingenuity students from Poly doing research at the Whiting School and the Krieger School. “The goal at Hopkins is to achieve excellence,” says Gray. “And this is our way to reach out to our community to help Baltimore City public school students do the same.”

—MP
Greener Pastures for Ames Hall

When 11 engineering seniors look at the flat, black roof of Ames Hall, they see the potential to make the world a better place. The fact that the roof membrane is old and scheduled to be replaced next year just makes it that much more appealing.

The roof is currently home to a couple of potted corn stalks (placed there by Professor Grace Brush to gather pollen samples). But the students envision it covered with the tiny white blossoms of sedum album, the delicate pink of sedum spurium, and many other colors of the more than 400 species of leaf succulents that comprise the sedum genus.

On May 8, 2007, the students presented this verdant vision for Ames Hall to university leaders, including Whiting School dean Nick Jones and Davis Bookhart, Johns Hopkins' manager of energy management and environmental stewardship.

The “Ames Hall Green Roof Proposal” is the culmination of their semester-long senior design project sponsored jointly by the departments of Civil Engineering and Geography and Environmental Engineering (DoGEE).

The project, originally proposed by Bookhart, charged the students with investigating the viability of covering the flat, rubber membrane portion of Ames Hall’s roof with a carpet of plants, one way that the university could demonstrate environmental leadership by embracing smart, sensible, and creative actions that promote sustainability. “This was an excellent way to teach our students about important changes happening in building design,” says Ben Schafer, an associate professor of Civil Engineering. “Especially the movement toward sustainability.”

“Especially the movement toward sustainability.”

The goal behind green roof projects like this one (which are now being embraced in cities spanning the country) is to offer protection against ultraviolet degradation, mechanical damage, and temperature extremes while simultaneously providing insulation that lowers heating and cooling costs for buildings and reduces the “urban heat island effect.” Additional benefits: Garden roofs contribute to better air quality, substantially reduce storm water run-off (which helps to mitigate sediment erosion), and offer urban meccas for birds, bees, and butterflies.

The students’ final proposal combines “extensive” and “intensive” approaches. The two sections over the building’s wings would be extensive, with a low soil weight and plants capable of surviving under a broad range of conditions, serving as a learning lab for students. The center section would be semi-intensive, with a single tree, a plastic deck, gravel paths, and benches—an area suitable for gatherings of students and faculty.

The students’ plan is now in the hands of Dean Jones and the Office of Facilities Management. “I would love to say that our design will be implemented,” says civil engineering design team member Emily Roche. “But if nothing else, I hope our presentation convinced the school that these kinds of adaptations are possible—that it can be done.”

To get to this point, the students worked in groups and tackled different aspects of the project including water management, stakeholder interests, the structural capacity of the roof, and a life cycle analysis evaluating the total environmental costs and benefits of the project. A structural analysis of the building determined how much weight it could support. The amount and quality of the roof’s water runoff was calculated and drainage options were considered. The students looked at the building’s thermal performance, selected different types of plantings, and considered the insulation benefits a green roof could offer. In addition, they balanced all of these factors against the admittedly higher cost of “going green.”

Ultimately, they concluded that although the initial investment to build a green roof would be $234,825 ($137,826 more than the cost of simply replacing the existing rubber membrane), the school would realize approximately $31,721 in cooling and storm water fee savings over the green roof’s predicted 40-year life span. Additional benefits include decreased air pollution and providing an example of sustainable design to the Hopkins community and beyond—not to mention, the green roof can be expected to last twice as long as the conventional roof planned for Ames Hall.

“This is the first time our departments have done a collaborative design project together and I think we met all of our objectives,” says Schafer. “The students worked together and learned how to do practical design that makes financial sense.” Adds DoGEE Professor Peter Wilcock, “The first design concepts they came up with were far too costly, but they were able to shift gears. They came up with a realistic design that could actually be built.”

The students’ plan is now in the hands of Dean Jones and the Office of Facilities Management. “I would love to say that our design will be implemented,” says civil engineering design team member Emily Roche. “But if nothing else, I hope our presentation convinced the school that these kinds of adaptations are possible—that it can be done.” —Abby Lattes
When Aeronautics Took Wing

Like a rocket blast, the Aeronautics Department at Johns Hopkins was relatively short-lived but nonetheless spectacular.

Francis Clauser founded the department in 1946 at the behest of a faculty committee and university President Isaiah Bowman, who wanted a program geared toward graduate study and research. Clauser, now 93, still clearly recalls the Sunday afternoon in 1946 when Bowman called him at his home in California. Aeronautics Committee faculty had been captivated by a talk on supersonic flow that Clauser had presented months earlier at the Applied Physics Laboratory (APL). World War II had proven that aeronautics was going to play a major role in modern warfare and travel and Bowman and others wanted the burgeoning field studied at Johns Hopkins.

“I think the whole engineering world, as well as the general public, was fascinated by the German V-1 and V-2 missiles and the great effort on the part of the U.S. military to develop new missile systems and supersonic missions,” Clauser says today. “The aircraft industry at the time was involved in a number of missiles projects, as were APL and [the Jet Propulsion Laboratory]. And aeronautics departments were cropping up at other schools, such as Cornell, NYU, and Michigan. So, establishing a department like this seemed a great opportunity for students.”

Clauser, a pioneer in the aeronautics field who would chair the department throughout its existence at Hopkins, previously worked for Douglas Aircraft Company, where he was a research aerodynamicist and flight tester. In 1945, he helped design the first communications satellite.

During the department’s first year, Clauser worked quickly to organize the department and hire faculty, notably Guy L. Bryan and Stanley Corssin. Housed in the new Aeronautics Building (which later became Merryman Hall), the department from its inception worked closely with research institutions and government labs such as APL, the Aberdeen Proving Ground, and the Naval Ordnance Laboratory, with personnel from these labs giving specialized courses to students.

Navy funding made possible the construction of a supersonic wind tunnel, which took three years to build and was completed in 1951. The department used the wind tunnel, located in the basement of the Aeronautics Building, to conduct experiments on turbulence and friction at subsonic and supersonic speeds—up to twice the speed of sound.

Four large aircraft engines powered the tunnel’s blowers that propelled air into a room where probes were placed to study flow. Mufflers were placed on the aircraft engines to reduce the noise, says Clauser. “We were all worried we’d upset the neighbors.”

In 1950, the department appointed Leslie G. Kovasznay, a renowned expert in turbulence, to the faculty. Other notable hires under Clauser’s tenure were research scientists Mark Morkovin and Robert Betchoh. Throughout the 1950s, the department’s examination of fluid mechanics and supersonic flow laid the groundwork for understanding what happened when missiles or airplanes go supersonic, and formed the basic principles that would affect aircraft design and flight at and below the speed of sound.

The Aeronautics Department had a seminar every week, typically on Saturday mornings, to allow distinguished scientists and researchers from outside Hopkins to present their ideas. In the January 2003 edition of the Annual Review of Fluid Mechanics, John Lumley, a former graduate student in the department and now the Willis H. Carrier Professor of Engineering Emeritus at Cornell, noted that the seminars usually ended with a barrage of piercing questions.

“I saw many speakers reduced to impotent rage, their seminars brought to a premature end. I am probably exaggerating, recalling the worst cases,” he wrote in an article about Stanley Corssin. “I am sure Stan and the others felt that they were setting an example for the students, teaching them not to accept claptrap gladly.”

Recalls Clauser, “We told [the speakers] ahead of time what it would be like; they knew of our reputation and what they were getting into. Most of them enjoyed it very much and after the talk the whole group of us would all go to lunch at the faculty club.”

Department faculty starred on a number of episodes of the TV series The Johns Hopkins Science Review, including “Flight at Supersonic Speeds,” which aired in February 1949, and a three-program series, Man Will Conquer Space, which aired in October 1952. The last of these three shows featured guest Wernher von Braun, a leading figure in the development of rocket technology.

In order to advance Hopkins’ program in mechanics, the chairmen of the departments of Aeronautics, Civil Engineering, and Mechanical Engineering jointly proposed at an advisory board meeting on May 3, 1960, that the three departments merge to form the Department of Experimental and Theoretical Mechanics. The advisory board unanimously passed the motion, adopting the name Department of Mechanics. The Aeronautics Department officially disbanded later that year.

Clauser, who left Johns Hopkins in 1965 to start the School of Engineering at the University of California, Santa Cruz and serve as its vice chancellor, said that his time at Hopkins was happy and the decision to form the Department of Mechanics was wise.

“Was I sad? A little,” he says, “but I thought it was the right thing to do.” —Greg Rienzi
Corporate Connections

On Site Insights

For Janine Yieh, MS ’06, a six-month internship with EA Engineering, Science, and Technology last year allowed her to get her feet wet—both literally and figuratively—in the world of environmental engineering, including wastewater management. In one project for the Carroll County Department of Public Works, she worked to upgrade the municipality’s sludge dewatering facilities, going on site to inspect and gather information to evaluate alternative design proposals.

“The internship was extremely interesting and relevant for me because it directly applied what I was learning in the classroom,” Yieh says. “It taught me how consulting actually works.” Yieh is the first recipient of EA’s newly created Jensen Fellowship, established in 2005 to sponsor a student pursuing a master’s degree in the Whiting School’s Department of Geography and Environmental Engineering (DoGEE). Named in honor of EA’s founder and current chairman, Loren Jensen, the fellowship covers a student’s tuition for two semesters and provides an internship at EA’s Hunt Valley, Maryland, office. The completion of the two semesters and the internship earns the student the 30 credits needed to complete the department’s master’s degree requirements.

“Analyze This

Every Tuesday this past spring semester, David Audley, PhD ’72 commuted by train from New York to Homewood to teach more than 30 graduate and undergraduate students enrolled in Mathematical Modeling of Securities and Financial Markets, a new course offered by the Whiting School’s Department of Applied Mathematics and Statistics (AMS).

“There’s huge student interest in the study of finance at universities across the country,” says Dan Naiman, chair of the department. “Math majors today are going on to work as financial analysts.”

To complement an already top-notch mathematics curriculum that includes some classes in finance, AMS has proposed a new master’s program in financial mathematics. And while the approval process moves ahead, the department decided to debut one of the offerings.

“For this class we knew we wanted someone with a strong mathematics background and market research, and financial technologies. In short, he has all the skills, knowledge, and practical experience needed to teach the class.

“I hadn’t been back here for years—since Christopher graduated,” says Audley. “So returning to campus, seeing what’s changed, was interesting.” He adds, “The high level of interest in the class didn’t surprise me, though, given the number of Hopkins graduates I see on Wall Street.”

Interest is so high that Audley will return in the fall to teach the second half of the course. “Students here can go to the library and learn about the relatively new concepts I cover, but what I have to offer is first-person experience.”

“Dave is not the only alumni practitioner on board,” Naiman notes. Jim Tzitzouris ’02 got his PhD from AMS, is now a vice president at T. Rowe Price, and has been teaching Investment Science since he graduated. “Our alumni are well-positioned to help us,” says Naiman. —AL
Comings...

**Charles Westgate**, a much-admired former Johns Hopkins Engineering faculty member, associate dean of academic affairs, and interim dean, will return to the Whiting School this fall to teach part time in the Department of Electrical and Computer Engineering.

Westgate joined the School of Engineering in 1966 and later served as a member of the faculty and administration. Named the William B. Kouwenhoven Professor of Electrical Engineering with a joint appointment at Hopkins’ Applied Physics Laboratory, Westgate was director and associate dean for the part-time engineering graduate programs (now EPP) and chairman of the Department of Electrical and Computer Engineering before becoming the Whiting School’s associate dean for academic affairs in 1994.

Although Westgate left for Binghamton University in 2001, where he has been the dean of the Thomas J. Watson School of Engineering and Applied Science for the past six years, the Westgate name—and legacy—have continued at the Whiting School. “His interactions with students were so positive that one of his former students endowed our most prestigious and largest merit scholarship in his name,” says Andrew Douglas, the Whiting School’s current associate dean for academic affairs. Douglas is referring to the Westgate Scholarship, a gift from Kwok Li ’79, that provides one or two freshmen each year with full tuition, plus a stipend. When he made the gift, Li said he wanted everyone to know “how much students at Hopkins value good teaching and caring teachers.”

**Jim Aumiller**, currently the project manager for the HopkinsOne implementation project, will join the Whiting School on September 1 as the new associate dean for finance and administration, where he will oversee finance, human resources, and information technology.

Aumiller has been a member of the Hopkins family for the past 19 years and holds a degree in accounting from the University of Maryland. He is a member and former faculty member of the National Council of University Research Administrators, a member of the Council of Government Regulators, and a member of the National Association of College and University Business Offices.

“I’m excited to move into a divisional school role as opposed to a central role,” Aumiller says. “It’s a new challenge for me. It will be more hands-on and I’ll be working closely with faculty. And, after having worked at both the Eastern and Mount Washington campuses, it’s great to be back at Homewood.”

**New Faculty**

**Sharon Gerecht-Nir**, a postdoctoral fellow at MIT who received her PhD from Technion-Israel Institute of Technology, will join the Department of Chemical and Biomolecular Engineering as an assistant professor this fall.

The design and behavior of steel structures, bridge design, and field monitoring are among the interests of **Reagan Herman**, who will join the Department of Civil Engineering this fall as a senior lecturer and assistant research professor. Currently an assistant professor in the University of Houston’s Department of Civil and Environmental Engineering, she received both her PhD and MS from the University of Texas at Austin and a BS from North Carolina State University.

**Susan Hohenberger** joined the Department of Computer Science this past January as an assistant professor. Hohenberger earned her PhD in 2006 from MIT’s Department of Electrical Engineering and Computer Science. Her specialty is cryptology and she used her expertise in the subject to launch a new course, Special Topics in Theoretical Cryptography, this past spring. “The students here at Hopkins are very good and the ones in my class were very enthusiastic,” she says. “I’m delighted to be here.”

This September, **Hana El-Samad**, who was a postdoctoral researcher at U.C. Santa Barbara (where she received her PhD in Mechanical Engineering), will join the Whiting School’s Department of Electrical and Computer Engineering as an assistant professor.

**Narutoshi Nakata** will join the Civil Engineering Department on August 1 as an assistant professor. Nakata recently completed his PhD in civil engineering at the University of Illinois at Urbana-Champaign. His interests include the development and application of experimental techniques, performance assessment of structural systems subjected to earthquakes, and cyber-infrastructure applications in engineering. He received his MS in civil engineering systems from the Kyoto University in Japan.

...and Goings

**Ilene Busch-Vishniac**, mechanical engineering professor and former Whiting School dean, will leave the School of Engineering on August 1 to join McMaster University in Hamilton, Ontario. At McMaster, she will serve as provost and vice-president academic.

“Johns Hopkins is a wonderful place and I have enjoyed being part of the Hopkins community over the last nine years. I leave with a mixture of regret and anticipation, saying goodbye to Hopkins and our friends and colleagues here, yet looking forward to becoming part of McMaster, another marvelous institution.”

During her time at the Whiting School, Busch-Vishniac made significant contributions to the school’s growth and academic success. She has been widely recognized for her research and has played an active and important role in the education of students. The appointment at McMaster will enable her to continue to make significant contributions to the fields of engineering and education.
Getting Laughs at His (Engineering) Expense

As a youngster, Jeff Caldwell ’84 made people laugh. “Usually it was the teacher laughing and not the kids,” he recalls. “I enjoyed making quips in the classroom, but my humor always appealed to an older set.” Instead of Bugs Bunny or the Three Stooges, Caldwell’s childhood heroes were Steve Martin, Richard Pryor, and the members of Monty Python’s Flying Circus.

But it was only after a stint working as an engineer and a couple of years in an engineering PhD program that Caldwell, now a professional comedian who has performed for both David Letterman and Craig Ferguson, decided to give comedy a serious try. “Between finishing my undergraduate degree and starting my graduate work, both at Hopkins, I worked at sewage pump stations,” Caldwell says. “I hated it. I had no idea what I was doing. I think my education had been, up to that point, more theoretical. My boss wanted me to do things like size a pump and I had no clue.”

Caldwell may not have realized it at the time, but that experience was the beginning of the end of his engineering career. He first got his nerve up to try stand-up comedy in front of a crowd in 1986, at what was then Baltimore’s Charm City Comedy Club.

“That first time did not go so well,” he recalls with an amused smile. “I’m not by nature an extrovert or a public speaker and I’m sure it was totally awful.” However, three weeks later he gave it another shot and within a year was no longer doing free open mikes but was getting paid regularly for his act. He dropped out of the graduate program (“I was being foolishly practical by studying engineering,” he concludes) and put all his efforts toward comedy.

“I just decided I was going to be myself and tell jokes,” he recalls. “If they didn’t laugh, well, that would be OK.” But they did laugh. And soon Caldwell was hanging out with and learning from some of the up-and-coming comedians of the time, such as Paula Poundstone, Paul Reiser, and club owner Bob Somerby. “I got to learn from the best and, meanwhile, develop my own style,” he says.

That style earns Caldwell a unique reputation that is most often typified by two adjectives: clean and clever. “I don’t have a problem with dirty humor,” he says. “I just am not dirty.” Comedian George Carlin describes Caldwell as “funny and smart.” For his part, Caldwell finds no “inherent value in insulting people. I thought the whole point was to make them laugh,” he says.

And laugh they do. Today, Caldwell performs regularly on television, for corporate audiences, and in comedy clubs across the nation. One recent spat of travel took him from a comedy club in Dayton, Ohio, to a bar in Manhattan, to a fundraiser for the symphony orchestra in Jackson, Tennessee—all in a week’s time. And this past fall, he performed for Hopkins students at the newly opened Charles Commons.

Caldwell ties his routines to reality—and his own life—as much as possible. Take his opening joke for Late Night with David Letterman: “I used to have a real job. I was a civil engineer. But, you know, people begin to talk when your third bridge falls down.” The audience roars. He gives them a few seconds, smiling as if he approves of their response.

“You know you’re not mechanical enough to be an engineer when you use a screw driver and have to say ‘lefty loosey, righty tightey.’” By the second joke, he has the audience members in his pocket and they never die down.

It seems his engineering education is paying off, after all.

—AR
A Resourceful Protector

Robert M. Summers ’72 (A&S), PhD ’81, had long worked to protect the environment, but on a recent canoeing trip with his teenage sons and friends down the Susquehanna River, he experienced firsthand the symptoms of polluted waters. Floating down the waterway that begins outside of Cooperstown, New York, and terminates in Maryland’s Chesapeake Bay, the group encountered rain-swollen sections of the river contaminated with sewage overflows and land runoff. “The trip was beautiful and not so beautiful,” says the Baltimore native, who majored in natural sciences at Hopkins and went on to earn a PhD from the Whiting School’s Department of Geography and Environmental Engineering. The tainted water wasn’t just hard on the eyes … it also gave Summers a bacterial infection in his ankle that required a trip to the hospital.

Fortunately for the rest of us, Summers is in a position to draw attention to the threat facing such natural resources and to craft plans to protect them. Last January he was named deputy secretary of the Department of the Environment for the state of Maryland. After 23 years working for state environmental agencies, most recently as the director of the Water Management Administration, he accepts his appointment at a critical time. “We’re under a lot of pressure,” he acknowledges. “Maryland is one of the most rapidly growing states in the country. There’s a good infrastructure here, but much of it has not been well maintained. We will have to redouble our efforts to improve and restore that infrastructure.”

A key player in the drafting of the momentous Chesapeake Bay Restoration Act that passed in 2004, Summers now casts an even wider net in his efforts to improve the environment. While contributing to policy that protects the watershed, manages hazardous and solid waste, cleans the air, and regulates building and development to minimize destruction, he also brings a scientist’s scrutiny to a position that’s been held in the past by non-scientists.

Because he understands the science behind the issues and knows how to relay that information to the public at large, he frequently finds himself called upon in state legislative hearings to answer questions about hydrology or sediment erosion.

From his home in Baltimore County, Summers contributes to the planet’s health through more personal gestures—driving a hybrid car, using fluorescent bulbs. He’s looking forward to tackling the complex issues facing the state’s next legislative session, like Maryland’s storm water problem: how to manage the toxins that dribble from driveways, yards, and streets directly into the water supply. “Restoring water quality has always been a driving issue for me,” he says, “but it’s all connected, what you put in the air, how you manage the toxins from driveways, yards, and streets directly into the water supply.”

—KL

After many years of service to the Whiting School, professors Robert Green Jr., Richard Joseph, and Jack Rugh will retire this year, but will remain involved with the school community as emeritus faculty members.

Green, the Theophilus Halley Smoot Professor of Engineering since 1998, has been a faculty member at Johns Hopkins since 1960 and retired from the Department of Materials Science and Engineering. During his career at Hopkins, he has been chair of the departments of Mechanics and Materials Science, Civil, Materials Science and Engineering and was the director of the Center for Nondestructive Evaluation from 1984 to 2001. He is a fellow of the Acoustical Society of America, American Physical Society, American Society for Metals, and American Society for Nondestructive Testing. He has worked for the Defense Advanced Projects Agency, the National Bureau of Standards, the U.S. Army Ballistic Research Laboratories, RCA, and the Underwater Explosions Research Division of the Norfolk Naval Shipyard.

Joseph received his BS in 1957 from the City College of New York and his PhD in 1962 from Harvard. He began his career at Raytheon before joining the Hopkins faculty in 1966. He was awarded the Distinguished Young Scientist Award from the Maryland Academy of Sciences in 1970, has been a fellow with the American Physical Society since 1975, and won the Outstanding Teaching Award from the Johns Hopkins Student Council in 1992. Joseph has been the Jacob Suter Jammer Professor in the Department of Electrical Engineering since 1982 and his research interests include electromagnetic theory and, in particular, applied optics.

Rugh, who has taught in the Department of Electrical and Computer Engineering since 1969, was named the Edward J. Schaefer Professor in 1991. Rugh holds his PhD and MS from Northwestern University and BS from Penn State University. He has published over 50 research papers and three books on linear and nonlinear control systems. Rugh is a Fellow of the IEEE and a Distinguished Member of the IEEE Control Systems Society, and he served as the Society’s president in 2001. He received the NEEDS Premier Award for engineering coursework in 2001. At Johns Hopkins, he received the W.H. Huggins Award for Excellence in Teaching and an Alumni Association Award for Excellence in Teaching.
What does the future hold for building design and construction?

Ben Schafer, associate professor of civil engineering and outgoing president of the Cold-Formed Steel Engineers’ Institute

These are exciting and challenging times for those civil engineers who have chosen to be both the stewards and creators of our built environment.

Globalization has influenced the construction workforce and the engineers who design the buildings. Immigration driven by the construction market is not just an American issue. My friends who are engineers sitting in offices in New York City are often designing buildings in Hong Kong. Just as common today is an engineer in India working on the design of a building in Chicago or Baltimore. For us here at Hopkins, this means we are beginning to train our students differently, with increased emphasis on flexibility, creativity, and, yes, in some cases, soft skills.

Sustainability, green buildings, green roofs—all of this was totally below the radar just a couple of years ago, but now everyone is talking about it. It seems we are close to a time when society will say, “I want a safe and efficient building, and I want it to have a low impact on the world.” If we unabashedly bring the concepts of sustainability into building design, then truly everything changes because existing design has ignored this aspect of buildings. (See “Designing Minds,” p. 7).

Information technology is maturing in building design. The big change everyone is talking about now is Building Information Modeling, or BIM. Our “pictures” of structures (which years ago were hand drawn by draftsmen and over the last years have been computer drawn) are going “live.” The models are merging with computational simulations of the actual building performance to create accurate simulations that engineers can use to design, redesign, and then later use directly as the plans for construction—a BIM model. This simulation-based design is changing civil/structural engineering, and in the Department of Civil Engineering we are at the beginning of an interesting collaboration with one of the leaders in this area, Bentley Systems. Bentley has already donated funds, computers, and software for our senior design course and is now beginning collaborations on a research level.

New materials are changing building design, particularly for repair and remediation where the high cost of new materials can be mitigated by their use only in the most critical areas. Sometimes we are also learning to use traditional materials in novel ways. In my research, we develop the means and methods for the application of thin steel structures, using steel less than 1 millimeter thick in most cases, to the design of buildings. These thin steel shapes are made by cold-forming coils of steel into structural shapes. Engineering these thin shapes into useful building components requires significant effort for the designer, and our research aids these engineers who are truly using a minimum of our precious materials to design the homes and shops we all need.

—AR

Throughout the summer, construction workers will put the finishing touches on the buildings and environs of the new Decker Quad, set to debut in October. Pictured here are the Computational Science and Engineering (CSE) building, Mason Hall, and the quad itself, situated above a 604-space, three-story garage. Mason Hall will be the campus’s new “front door,” housing the Office of Undergraduate Admissions and a welcome center. Inside, interactive kiosks and displays will provide a lively overview of Hopkins history and information about the university today. The CSE building will be home to the Engineering School’s robotics research and academic offerings, the Institute for Computational Medicine, and the Center for Language and Speech Processing.
It all comes down to this: Undergraduate Admissions Director John Latting signs letters of acceptance, the culmination of many months—and many rounds—of reviews.

MARCH 27

There is a controlled urgency in the air and a sense of organized chaos. It seems that everyone is talking at once, both staff and students, about which bins hold envelopes ready to be mailed, envelopes needing stamps, and envelopes needing to be sealed. An undergraduate hustles past with a slice of pizza in one hand and a stack of postage slips in the other. A staff member sits on the floor, her shoes kicked off and a bin of letters in her lap, applying $4.05 worth of postage to 3,588 large envelopes.

The 40 or 50 people here tonight in the basement of Garland Hall are packed into two long hallways and a small, windowless room. Plastic blue bins, crammed full of U.S. Priority Mail envelopes, line both hallways, are stacked three deep in mail carts, and cover all available counter space. What each envelope contains, along with several pieces of supplemental materials, is a sheet of paper coveted by 14,842 high school seniors: a Johns Hopkins University acceptance letter.

It's 6 p.m. on Tuesday, March 27. Acceptance letters—and rejection letters—will go out in the morning.

“The Ivies post decisions online on Thursday and we want to beat them,” is one staff member's explanation of tonight's mad, after-hours rush. “We've been waiting all day for our director to be satisfied with the class,” another explains. “Nothing's final 'til these letters hit the mail.”

In fact, their director, John Latting, hadn't made his final decisions until late that afternoon. What kept him fretting all day, locked in his office, was the handful of applications teetering on the edge of acceptance or denial.

Latting, Hopkins' Director of Undergraduate Admissions, is charged each year with shaping the next freshman class. “A perfect freshman class,” he says, “is one in which every single student has a deeply rooted desire to learn, motivation, and a sense of purpose. We won't accept kids who are simply going through the motions, no matter how smart they are. They must be open minded and willing to change.”

The scene in the mailroom draws a stark contrast to the admissions process itself—a carefully orchestrated process in which every single application is individually evaluated. Part of the goal is to have 405 freshman engineering students walk onto the Homewood campus this fall. Of the 14,842 students who applied to the university, 3,916 applied to the Whiting School, and Latting has already accepted 130 of them as “early admission” for engineering.

The competition for the remaining 275 spots is intense. Last year, the undergraduate students admitted to Hopkins had an average high school GPA of 3.69, SAT math scores between 660 and 760, and SAT verbal scores somewhere between 630 and 730. Eighty percent of freshmen were ranked in the top 10 percent of their high school class. These are the

Admit? Deny?

When “March Madness” descends on Admissions at Johns Hopkins, this portentous question becomes all-consuming. We take you inside Garland Hall, in the stomach-churning weeks leading up to the big mail drop on March 28, as Hopkins admissions experts grapple with crafting the “perfect” freshman class.
best of the best. Not surprisingly, these are the students who are also applying to schools like MIT and Harvard. Those whom Hopkins accepts will, most likely, receive attractive offers from other schools, too. So, to enroll 405 engineering students, Latting and his admissions team have figured out that they must offer admission to 1,405.

“But we don’t want 405 biomedical engineers,” says Bill Conley, dean of enrollment and academic services, of the Whiting School’s most popular discipline. “We want 100 biomedical engineers and the other 305 should be proportionately distributed across the other departments.”

Quite a formidable challenge for the admissions staff, enough to keep Latting and company’s stomachs roiling throughout winter and into spring. What factors shape their evaluation process? To begin with, they don’t just admit those with the highest test scores.

“Talent is dispersed across all different types of people, who have different cultures and backgrounds,” Latting says. “Different perspectives make a good incubator for innovative thinking. If you value innovation, then diversity is what you need.”

Conley points out that this effort to shape the class represents the most fundamental shift in the admissions process in the past 25 years. “We used to think we should simply admit the smartest kids and let an invisible hand distribute them,” he says. “We can’t do that anymore.”

So, to arrive at their desired outcome, Conley, Latting, and their team of admissions counselors and staff immerse themselves in an in-depth process that culminates in an admissions version of March Madness. Counselors have spent two months reviewing every application, and the best survived to be considered by multiple committees. The process is an individualized one that does not occur at every college or university. And though admissions at Hopkins is viewed as an art, not a science, this is where things get complicated.

With the big mail drop just 12 hours away, student volunteers help stuff, seal, and apply postage to letters going to this year’s 14,842 applicants.
MARCH 14

Two weeks earlier, it’s late in the morning and admissions counselors Daniel Creasy and Mark Butt sit in their Levering Hall office. Poring over applications, they face the first hurdle of the March process: guaranteeing that enough engineering students are offered admission so that at least 405—but no more—will accept.

Predicting such results requires a complex method, and the admissions office has looked close to home for expertise. John Wierman, a professor in the Whiting School’s Applied Mathematics and Statistics department, has created a formula that uses statistics and logic to rate various sections of an application and determine the probability that the applicant, if offered admission, will accept. Dubbed “The Wierman Model,” the algorithm has been used in Hopkins’ admissions process for more than a decade and takes into account such factors as the applicants’ areas of study, whether they’ve visited campus or not, what region they’re from, financial aid status, and just about every aspect imaginable that could affect the probability of their saying yes to Hopkins.

“One of the most interesting factors is what state they live in,” says Wierman. “We’ve found that those who live between 200 to 400 miles away have the highest rate of acceptance. It’s as if parents think that if it’s over 400 miles from home, it’s too expensive to get there frequently, and the kids think just the opposite: 200 miles is far enough from home that they feel like they’re out on their own.”

The Wierman Model is reformulated each year to reflect changes in the marketplace, such as the recent trend of students applying to seven or eight schools instead of the three or four that previous generations did. (While the “shotgun” approach might increase the number of schools a student can potentially choose from, it decreases Hopkins’ success rate for recruitment.) Latting uses the program about every two weeks during his decision-making process. It helps him avoid admitting 1,405 students, in the hopes of 405 accepting; and facing the nightmarish situation of having every one of them—or none—accept. “If we’re wrong on our numbers,” Wierman says, “we could end up having 200 people doubled up in dorms or the opposite and not enough.”

With an application deadline of January 1, admissions counselors began reading applications back in December. Throughout January and February, the team of nine read each of the nearly 15,000, selecting the best to be passed on for review by small committees. By now, in mid-March, the counselors and committees have trimmed the stacks to 4,000. About 1,500 of the remaining applications are for Engineering and the day’s goal is to cut 100 of them.

The easiest place to look is the Biomedical Engineering (BME) Department. As the top ranked program in the country, BME is the only department that requires students to apply specifically by major and does not accept transfer students. The counselors know that the chances that a BME applicant will come to Hopkins if he’s been declined BME are slim. So Creasy and Butt scrutinize the stacks of applicants with BME elected, looking for those who aren’t strong enough for acceptance into this highly competitive program.

The data sheets the two men pore over are three feet wide, requiring them to use yardsticks to follow the 50 horizontal data fields that stretch across the page for each student.

“Here’s a 3.7 from Rhode Island, decent transcript, no extracurricular activities,” Butt says. “Test scores are low, he wants BME—but he’s not going to get it and his second choice is Arts and Sciences.” After a few more minutes of back and forth, it’s decided to leave the application in the admit pile—for the time being. The duo moves on to the next applicant.

“This kid has a 550 Math SAT… he needs to be cut. This one is from Greece, passed the TOEFL, and has high math scores… he can stay for now. Do you know where Santa Maria High School is? What do we know about it?” Butt asks, searching for a reason to overlook the applicant’s low test scores. “Well, she’s first generation… I think she’d add a neat perspective. Let’s keep her for now.” The team will reconsider her in the next round of reviews.

The truth of the matter is that many students apply to BME because it’s related to medicine and they see it as a steppingstone to medical school. But, there’s a chance that a student who doesn’t succeed at BME won’t stick with engineering. Most likely, that student will choose to transfer majors to a non-engineering/medical-related subject such as biology or chemistry. “We call them ‘migrants,’” Butt says, “and having students swap between schools is an administrative nightmare.” Not only that, but if it happens
in excess, it upsets the balance of Latting’s carefully selected freshman class. BME applications are specifically examined for this risk.

**MARCH 21**

Deny and waitlist letters—all 11,254 of them—are being printed in preparation for the March 28 mass mailing. Even though two printers churn them out, it’s several hours before they can be hand-stuffed into envelopes: single sheets of cream-colored paper in matching—disappointingly slender—envelopes.

The Garland Hall rooms of the Admissions Office are teeming with counselors and staff, gathered around the office’s 21 filing cabinets. The metal cabinets, each five drawers tall, contain the folders for every applicant this academic year. With so many responses being mailed, it is imperative to continually confirm that every applicant will be mailed the correct letter. As the mailing draws closer, teams conduct “drawer checks.” As one person inches through the master folders in the filing cabinets, calling out a name and a decision, another thumbs through a bin of deny and waitlist letters, confirming they are correctly matched. Letters for accepted students haven’t been printed. There are still a few of those decisions yet to be made.

Two days later, on March 23, Latting sits behind the closed door of his office, struggling over the final questionable files. There are about 40 left to consider, and all have agreed that they have strengths and weaknesses that make the decision very difficult. The admissions counselors have all but thrown their hands in the air and left Latting to make the final yes or no.

Some of the applications have already been deemed denies, but someone—a counselor or faculty member—has asked Latting to reconsider. However, most applications in this group were leaning toward accepted status, but there was something questionable: there’s a disciplinary problem, one applicant is younger than average and Latting worries he’s not yet mature enough to handle college, and one transcript shows that the student’s grades dropped in the final year of high school.

Latting is also factoring in how much financial aid he can give to international students (federal loans are scarce and schools usually reserve the majority of their aid for U.S. citizens), Baltimore Scholars (a full tuition scholarship to accepted students from the Baltimore City public school system), and children of employees. In one case, a student has refused to submit the application fee or a fee waiver and Latting is scouring the application to figure out if there’s a financial hardship that

In the middle of all the activity, Butt walks in with a list in his hand. “Is that it—do you have it?” Creasy asks, excitedly. He’s referring to the list of 12 finalists for the Westgate Scholarship.

**Hopkins Interactive** Today, more than ever, high school students are turning to the Internet to get information about prospective colleges. The Hopkins Admissions Office offers a new website, called Hopkins Interactive, which includes Hopkins Insider, “behind-the-scenes access” to the Admissions Office; Hopkins Interactive Guest Blog, which features different straight-talking students each week; The JHU Fun Blog, which uses “traveling gnomes” to highlight the fun to be had at Hopkins; and This Week@Hopkins, a weekly Hopkins entertainment events listing.

Such sites not only help to humanize the university and the admissions process, says John Latting, they convey the idea that college life at Hopkins is fun, vibrant, and relaxed. “It’s showing that Hopkins is a small, close-knit school where students have lots of freedom to pursue their interests, where they can explore, and where they are surrounded by interesting people,” he says. Visit [http://apply.jhu.edu/hi/blogs/blogs.html](http://apply.jhu.edu/hi/blogs/blogs.html).
now in medical school at Yale.

Of the finalists this year, one student scored an 800 on the SAT, the SAT I, the SAT II, the Verbal SAT, the Math SAT, and the Latin SAT, a 760 on the Biomolecular SAT, and a 750 on the Physics SAT. What impressed faculty most was the applicant’s research conducted in high school; it focused on computer models of accreting neutron stars. But though his test scores are high, so is his parents’ household income, weakening the allure of the full-ride aspect of the Westgate. For him, the tuition break may not succeed as the carrot it was designed to be.

However, another finalist may very well appreciate the break in tuition. As a non-U.S. citizen, her access to financial aid is limited. According to Douglas, this remarkably gifted student has achieved what very few have. “You just look at her and wonder how she managed to get from where she was to where she is now,” he says. Her SAT scores and grades are high, so is his parents’ household income, weakening the allure of the full-ride aspect of the Westgate. For him, the tuition break may not succeed as the carrot it was designed to be.

While Douglas and the team of faculty who conduct on-campus interviews with each candidate decide which of the 12 applicants to offer the distinguished Westgate, Creasy and Butt are facing the reality of Latting’s decisions. It’s now the late afternoon of March 27.

All decisions have been made.

“One of my kids was cut,” Creasy says of a student he had gone to bat for. “I just wanted to go to John and say ‘please…..’ Honestly, there are very few things I’ve done in my life that are this emotional.”

But, however much a single counselor likes a particular student, each knows that Hopkins can only admit so many and that the 10 percent of total engineering applicants who will end up at the Whiting School can’t include everyone.

In the basement of Garland Hall, staff, counselors, and student volunteers proceed through the bins. The floor is littered with strips of discarded paper from postage slips and postage envelopes, the room hums with chatter, and blue bins are whirled past, headed for the mail carts.

“Here’s one of mine!” admissions counselor Jeremiah Shepherd exclaims to himself as he spies a name on one of the envelopes. “It’s cool when you can follow someone through the whole process,” he says. “From meeting them at a school visit, reading their application, and then seeing them in this bin, as opposed to the ‘denied’ pile—it’s all very exciting.”

As the clock ticks well past dinnertime and as envelopes are stuffed, given postage, and sealed for the morning mailing, some 14,842 high school seniors eagerly await their verdict from Johns Hopkins.

Says Conley: “My dream for Johns Hopkins is that when a graduate tells someone that they went to school here, the reply is no longer, ‘Oh, did you want to be a doctor or a scientist? Was it brutal? Was it cut-throat?’ but that the response becomes, ‘Wow, you must be a really interesting person.’ That will be the barometer to show me that we’re getting the right distribution of students; that we’re achieving the perfect freshman class.”

POSTSCRIPT Days after the May 1 due date for all acceptance responses, Latting and his staff feel great about the results of their efforts. Although 424 students accepted for the 405 engineering spots—just a bit above the target—it is proof that Hopkins Engineering holds an even stronger position than in years past.

Because the Krieger School pulled in 758 students (goal: 800), Latting has ended up with 23 open slots for Arts and Sciences. “This is just ideal,” he comments a few days after the deadline. “We can now go to the wait list, which, though you don’t want to use it massively, is always good to use a little. It enables us to meet specific needs of the class, and it’s encouraging for future students to see that the waitlist isn’t a hollow offer.”

Latting’s only area of concern is the unexpected bounty of BME student acceptances. At 140, it is well over the target of 100, telling Admissions that BME at Hopkins is more popular than ever and that they need to rethink their estimates for next year. It also gives the BME Department four months to prepare for 40 extra students, the kind of challenge that can never be fully expected, no matter what steps are taken or what predictive models employed.
Powerful Ideas About Oil

When Roger Stern, PhD ’07 was accepted into the graduate program of the Whiting School’s Department of Geography and Environmental Engineering (DoGEE), he felt lucky. A botanist with what he says were only average math skills, he was interested in studying the intricacies of water pollution regulation.

Five years later, his work was literally making headlines. Only it wasn’t about pollution. It was about the world oil situation, nuclear proliferation, and the U.S. standoff with Iran.

Geographer and alumnus Roger Stern had no idea the media frenzy his conclusions would ignite when he published his latest findings about Iran and its oil supply.

By Kurt Kleiner, MA ’92 (A&S)
Photos by Jon Gilbert Fox
According to Stern’s numbers, by 2014 Iran could actually be facing an oil shortage, even though there’s plenty of oil left in the ground.

The attention started last December when Stern published a paper in *Proceedings of the National Academy of Sciences (PNAS)* saying that the Iranians might be telling the truth when they say they need nuclear power to meet domestic demand for electricity. That paper spawned reports in *The New Yorker* and *The Washington Post*, on National Public Radio, and hundreds of other news outlets, and kept his phone ringing for days with reporters looking for interviews.

“It was wild,” says the 56-year-old. And a long way from sea grasses and marine pollution.

Stern majored in biology at Antioch College in Ohio and received a master’s in botany from the University of Vermont in 1983. He quickly moved into the policy side of the environmental movement, working for four years for the Nature Conservancy in West Virginia, and then starting in 1991 as the executive director of the Marine Studies Consortium in Wellesley, Massachusetts.

As part of an effort to restore the state’s coastal areas, he tried to get government funding to mitigate non-point-source pollution—the runoff from lawns, streets, and farms that causes most water pollution.

But Stern soon butted heads with an alliance of bureaucrats and utility subcontractors who were interested only in expensive, large-scale mitigation efforts. He fought to free up money for small-scale remediation. Just as important, he found that his intellectual interest was piqued.

“All of these interests in anomalies between policies and actuality transferred perfectly to the world of energy policy,” he recalls. “There was a set of ideas, some of which may have once had a vague connection to reality, but which no longer did, but still ruled the way the problem was imagined by those with the power to do something with them.”

At a conference Stern organized, he met John Boland, professor emeritus in the Whiting School’s Department of Geography and Environmental Engineering. That meeting led to Stern’s eventually applying to Hopkins.

Stern says he was eager to work with Boland, an engineer and economist who is an internationally recognized expert in water policy. He was also attracted to DoGEE—which offers programs ranging from environmental chemistry to wastewater treatment to economic analysis—because the department encourages a multidisciplinary approach to solving environmental problems.

“We’re a good environment for students who want to bring different things together,” says Boland, who was Stern’s thesis adviser. “[Roger] was probably an extreme example of that. He was already trained in biology and ecology and other skills. That was one reason I thought he would work out well in our department.”

Stern couldn’t afford to give up his job or move to Baltimore, so he continued to work part time, flying in two days a week from his home in Massachusetts.

But during his second week of classes the 9/11 attacks occurred, and Stern became much more interested in the Middle East and terrorism. The following spring he heard David Green of the Oak Ridge National Laboratory speak about the immense oil profits being funneled to Middle Eastern countries. Stern had a new academic subject to explore.

He published his first paper in January 2006 in *PNAS*. It was titled “Oil Market Power and the United States National Security.”

“I considered it to be a very severe critique of past policy, and of the Bush administration. It’s much more incendiary [than the Iran paper], and of much higher public interest,” he says.

At the heart of that first paper is the idea that there is no real shortage of oil, an idea that has been advanced by Morris Adelman of MIT and other economists. Their work directly contradicts “Peak Oil” theorists, who contend that global oil production will soon begin to decline.

Adelman and others say that economic indicators suggest there is still plenty of oil in the ground. Stern advanced the argument by collecting historical information on the investment needed to get oil out of the ground in a number of Middle Eastern oil fields. He showed that this “recovery cost” has actually declined over time, which you would not expect if oil were truly becoming more scarce.

Instead, Stern says that the evidence suggests that OPEC countries intentionally keep supplies low and prices high by not developing oilfields as fast as they could. Using the data he collected on recovery costs, he estimates that in oilfields as fast as they could. Using the data he collected on recovery costs, he estimates that in

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Instead, Stern says that the evidence suggests that OPEC countries intentionally keep supplies low and prices high by not developing oilfields as fast as they could. Using the data he collected on recovery costs, he estimates that in a truly competitive market, oil would likely be selling for between $4 and $10 a barrel, not the $60 a barrel and up it demands now.

On the other hand, he notes, OPEC doesn’t really have the power to use oil as a political
weapon. If OPEC refuses to sell to the United States, the third parties it does sell to will eventually resell the oil to the U.S. anyway. And if OPEC tries to limit oil production further, as it did in the 1970s, prices will skyrocket, demand will fall, and then prices will collapse.

The real security threat, Stern argues, comes from the huge wealth the OPEC countries have amassed, which he calculates to be $100 billion dollars a year or more over a fair return in a competitive market. Some of that money, he pointed out, goes to fund extremist religious movements and terrorist organizations.

It also makes every OPEC country a ripe target for a military takeover by other countries hoping to corner more oil wealth, just as Iraq attempted to annex Kuwait in 1990. Fearing the rise of a single oil superpower, the U.S. devotes additional billions in military spending as a preventive measure.

Stern's recommendation is a simple one: The U.S. and other countries should lower oil demand through conservation and energy taxes. Prices would fall and OPEC profits would decline to more reasonable rates, leaving less money for terrorism, and less incentive for one country to invade another, he argues.

That paper inspired no interest from the media.

“The first paper was completely ignored. It was like nothing ever happened. I had thought I was going to get death threats,” Stern says. And, despite being published in the highly respected *PNAS*, it also didn't seem to be leading to any job offers.

So, it was a pleasant surprise when, almost a year later, the paper on Iran created such a media stir. In that paper, Stern suggests that Iran might have a legitimate need to build nuclear power plants to meet domestic energy demand—something the Bush administration has argued strongly against, saying that with so much oil, Iran can't possibly need the plants for energy production.

But Stern dug up the numbers on the amount of oil Iran was producing, how much it uses domestically, and how much it would need to invest to continue to meet domestic demand and make up for the wells that were being depleted. According to Stern's numbers, by 2014 Iran could actually be facing an oil shortage, even though there's plenty of oil left in the ground.

Stern also concluded that the looming Iranian oil shortage is largely a result of political decisions. Iran subsidizes domestic consumption, which keeps demand high; and the nation is hostile to foreign investment, which means it has a hard time increasing production.

Stern thinks that the barrage of news coverage this second paper received was due, ironically, to his suggestion that an oil-rich country might be running out of oil.

“I was inadvertently tapping into Peak Oil mania,” he says.

Adelman, the MIT economist, praised Stern for taking a realistic look at the global oil situation, one that goes against the tide of most media reports.

“Good luck to him in trying to bring a little reason into the dialogue,” Adelman says.

Not everyone agrees with Stern's conclusions, of course. Many remain skeptical of the idea that economic indicators are capable of signaling how much oil is left in the ground. Cleveland Cutler, a professor in the Department of Geography and Environment at Boston University, thinks that economic indicators like cost of recovery don't do a good job of predicting when oil production will begin to fall.

“The notion that we can use the market to signal peak oil is pretty much false. There's no evidence to suggest that reality matches the theory,” Cutler contends.

Although Stern might not have convinced everyone, the attention from the Iran paper has gotten him noticed. He has given talks all over the country, and in May accepted a fellowship at the Princeton Transregional Institute.

“It’s been very heavy going,” Stern says. “I'm not an economist, I'm not a political scientist. The academic world doesn’t look kindly on interdisciplinary work by those who haven't established themselves as experts.

“But I'm not going to quit what I'm doing. The story's too big. It's endlessly fascinating.”
Through advances ranging from artificial corneas to prosthetic limbs that truly "feel," Whiting School engineers are striving to overcome the ravages of injury, disease, and decay.
Cowan’s Locomotion in Mechanical & Biological Systems (LIMBS) Laboratory has spent the past four years studying the way the cockroach uses thousands of antennae sensors to navigate in the dark and dash across rooms. The cockroach’s brain processes sensory information as quickly as the bug speeds along a wall at a remarkable 25 body lengths per second. LIMBS researchers found that the curve of the antennae against a wall “reads” the shape of the wall, signaling the cockroach how fast to turn.

Using their data, Cowan and his students built an orange-and-black wheeled metal “cockroach” the size of a shoebox, complete with a flexible, rubber-like antenna. Several flex sensors measure how much the antenna bends as it moves against a wall. A computer program translates the information into distance data, which the robot, just like its six-legged inspiration, uses to judge and adjust how far it is from a wall. In addition to medical applications, their research, which landed on the May 2006 cover of *The Journal of Experimental Biology*, may help in developing better robotic navigation in collapsed buildings, caves, and various emergency situations.

By Sarah Achenbach
Illustration by Ken Orvidas

From the intricacies and mysteries of brain function to the speed at which a sneeze leaves your mouth—it can be in excess of 100 miles per hour—the human body is an engineering marvel. Even more so, when you consider that outside of reproductive organs, the components are basically the same in every model, but every one of the more than 6.5 billion models on the planet is genetically unique.

For all its sophistication and wonder, the human body is also a system that is prone to disease, decay, and injury. Organ failure, cancer, spinal cord injuries, blood clots, and amputations: Every day, these issues and more affect millions of people. With cutting-edge research in tissue and cell engineering and neural prosthetics, Whiting School faculty and students are helping to change the way we think about the human body—and how we heal it.

Noah Cowan, assistant professor of mechanical engineering, spends his time thinking about things most of us would rather not. Cockroaches scurrying along a wall. The eerie glow of the transparent electric knifefish. His discoveries about how the brains of these lowly creatures direct movement could eventually lead to advances in rehabilitative therapies for stroke patients, people with cerebral palsy and other debilitating conditions, and better, less jerky prosthetics. “The interface between brain and machine is only partially understood,” says Cowan. “Our results may one day be used to guide the design of brain-controlled prosthetic limbs so that they match our own natural performance.”
To dream big, professor Andreas Andreou ’86 thinks small. Very, very small. Two years ago, he and his research team in the Whiting School’s Department of Electrical and Computer Engineering (ECE) began work on a silicon cortex using nanoscale 3-D silicon on insulator complementary metal oxide semiconductor (SOI-CMOS) technology. Roughly 4,000 times thinner than the human-hair-width 2-D microchips used in today’s computers, this new technology allows Andreou to stack multiple chips to enable the design of highly interconnected circuitry that comes closer to the brain’s neural hardware than ever before. The silicon cortex chip could potentially be used to overcome brain injuries and degeneration and to augment electronic interfaces to advanced prostheses.

“The brain isn’t a super computer,” explains Andreou, who received his PhD in 1986 from Hopkins before joining the Whiting School faculty almost two decades ago. “It’s an incredible network with the computing occurring directly in the network. One of the challenges in engineering silicon brains is that the cortex has enormous connectivity that, until recently, we couldn’t replicate in silicon.” Using SOI-CMOS technology to create a silicon retina and cochlea, combined with his research in speech and language processing (he co-founded the school’s Center for Speech and Language Processing with retired ECE professor Moise Goldstein), inspired Andreou’s next leap. “The 3-D silicon technology allows us to go beyond the limits that appear on the horizon of technology,” he says. “Now we can think about making a silicon brain that will have true cognitive abilities.”

The way we perceive the world is through our eyes, ears, and skin. If we could augment cognition with a silicon cortex, why not? There are a few times I wish I had more brain power,” he says.

After testing and tinkering with their first prototype, Andreou’s team synthesized the second generation 3-D silicon cortex chip, which is currently being manufactured. “Like babies, these chips come out in nine months,” he jokes.

The 3-D silicon cortex chip complements other research in his lab. Electrical and computer engineering PhD student Miriam Alderstein Marwick has used CMOS technology to design a silicon photoreceptor that can detect single photons and hence can see in the dark, just like rods in the retina. According to Andreou, its performance is comparable and even exceeds that of biological systems.

“When I started my career, we said that we’d never be able to make a silicon brain,” notes Andreou, who in 2005 was named an Institute of Electrical and Electronics Engineers (IEEE) Fellow for his groundbreaking work in energy efficient sensory microsystems. “I was scared at first when we started developing the silicon cortex, but what is humanity? We need to have an open mind.”

Thanks to the electricity emitted from the small, South American knifefish, Cowan and Eric Fortune, assistant professor of psychological and brain sciences in the Krieger School of Arts and Sciences, are shedding new light on the complexities of human locomotion. Though the two professors are next-door neighbors in north Baltimore, neither knew the other’s area of expertise until 2004 when Cowan asked Fortune’s daughter what her father did at Hopkins. “She told me that he poked fish brains, and my eyes lit up,” says Cowan. “Eric wasn’t applying mechanical analysis, but doing cutting-edge neurobiology with the fish [to study the neural basis and evolution of behavior]. It was like peanut butter and chocolate. Neither of us could have done this alone.”

Just four hours after Cowan first visited Fortune’s lab, the duo had the pilot data for their first successful grant from the National Science Foundation. “The knifefish’s ribbon fin can generate a force that moves it forward and backward in a line,” Cowan explains of their experiments in which they place the fish in an open-ended tube and move the tube back and forth. “The fish swims its fins off to stay in the tube.”

Using its eyes and sensory cues from the weak electric signal the nocturnal fish uses to “see” in the dark, the fish instinctively measures velocity and makes the necessary speed adjustments using sensory feedback from all over the body. “By examining the sensory processing systems of a diversity of animals, we begin to see that every animal has to cut the speed of these chips out to stay in the tube,” Cowan explains of their experiments in which they place the fish in an open-ended tube and move the tube back and forth. “The fish swims its fins off to stay in the tube.”
Collagen

Supermodels and Hollywood starlets aren’t the only ones who use collagen. “If you look at any animal, collagen is the basic framework for any tissue,” says Michael Yu, assistant professor in Materials Science and Engineering. “Almost 30 percent of our body’s protein is collagen.” This common, non-toxic protein is the workhorse of the human body. It promotes blood clotting, rarely triggers rejection, and its sponge-like scaffolding is essential for cells to grow nerves, bones, and skin.

Collagen is also the framework for Yu’s research. In August 2005, he pioneered a new, easy way to modify collagen by mixing it with minute molecules called collagen mimetic peptides. Prior to this, collagen was altered by cooking it at a high heat or by mixing it with intense chemicals, techniques that can damage the protein itself, as well as cells and other bioactive molecules that co-exist with collagen. Yu’s technique attaches the “hitch-hiking” mimetic peptide to collagen, binding it to the collagen’s triple-helix structure. Like any good marriage, the tiny peptide fills in gaps in the collagen’s rope-like configuration. The peptide is loyal, too, attaching only to the collagen.

In February, Yu received a National Science Foundation CAREER Award to perfect his technique (see p. 5) and to create biomedical applications for modified collagen, such as using it to thwart the formation of scar tissue. Modified collagen may also help to prevent organ transplant rejection by ramping up blood vessel vascularization—the speed of the process and the proliferation of blood vessels during vascularization are critical to successful transplants. In addition, blood clots in arteries and tumors could be detected through imaging techniques using the collagen mimetic peptides, and a collagen-based bandage could fight infection longer and more effectively.

He says the ultimate goal, though, is to engineer tissue and create new organs. “Recently we’ve been exploring how our technique could be used to make artificial corneas. If all medical tools fail, the last alternative is to replace an organ. My research begins where medicine’s options typically end.”

Mimetic peptides bind with collagen proteins to create modified collagen that could help prevent the formation of scar tissue.

As the clear part of the eye’s outer wall, it covers and protects the iris and pupil. As the eye’s camera, it transmits light and refracts images onto the retina, enabling us to see the world around us. Damaged corneas from disease, injury, or infection are the fourth leading cause of blindness in the world. Each year in the United States, an estimated 30,000 corneal transplants are conducted, making the surgery—which involves replacing a disc-shaped segment of the cornea with a similarly shaped piece from a healthy, donated cornea—by far the most common of all transplant operations today.

Consider the drawbacks, though. Corneal transplants are rejected 5 to 30 percent of the time, and the operation can lead to infection, bleeding, and glaucoma. Then there’s the constant need for donated corneal tissue.

Jennifer Elisseeff, assistant professor of biomedical engineering, considers this and more as she engineers artificial adhesives for the eye to repair corneal damage and repair and seal the incisions made during cataract procedures. The research team in her Biomaterials and Tissue Engineering Lab at the Whitaker Biomedical Engineering Institute at Johns Hopkins works closely with Oliver Schein, the Burton E. Grossman Professor of Ophthalmology at Hopkins Willmer Eye Institute. Eventually, their collaborative research may lead to artificial corneas that could be used in transplants.

Three years ago, Schein approached Elisseeff about partnering to pioneer materials for the eye to be used in corneal and cataract surgery. “It’s a new field,” says Elisseeff of their biomaterials, which have just begun animal trials. “The chemistry is still very synthetic for materials used in the eye today, such as contacts. There is strong potential for incorporating [many] more biological materials into the eye. We try to do novel, innovative strategies.”

Elisseeff uses hydrogel scaffolds—a 3-D network for cells to rebuild tissue—to engineer artificial corneal tissue that mimics the way real corneal cells divide, differentiate, and proliferate. “Growing cells is an art,” she says. “The engineering part is important. You’re tinkering and building tissues that can integrate with the body.”
Open Shut. Open Shut. The shiny, blue robotic replacement hand after Darth Vader whacks off the real one with the whooosh of his light saber fist. An undergraduate student wearing a bonnet-like cap fitted with non-invasive electrodes sits in front of the hand. As he thinks about moving his hand, a computer captures the change in his brainwaves and opens and closes the mechanical hand on command.

Other robotic hands rest on nearby lab tables, their palms and fingers as graceful and smooth as those of a Greek statue. Unlike their sci-fi counterpart flexing its fingers a few feet away, these hands look human with skin-like cosmesis. The 20-plus student and faculty research team in Nitish Thakor’s Biomedical Instrumentation and Neuroengineering Lab at the Johns Hopkins School of Medicine are working hard to make sure these state-of-the-art prosthetics function as human hands, too.

The hands “feel” temperature through sensors embedded in the fingertips of the cosmesis. The sensors heat up or cool down depending on the temperature of the object it touches. And thanks to flexible force sensors mounted on the prosthesis, and a shoulder harness providing vibrating haptic and vibrotactile feedback, the hand can also sense how much pressure to apply when picking up a pencil or paper cup or squeezing a ketchup bottle.

The robotic hands under development represent the next generation of prosthetics: neurally controlled devices that recall brain signals and decode them in real time. These prototypes are light-years beyond the standard prosthetic hand available today: the Otto Bock hand, a “Captain Hook-like” device that opens and shuts through EMG control and feels artificial limbs using signals from our brain, nerves, and muscles directly.

It’s also helping to kick-start a whole new field, something Thakor knows a thing or two about. Twenty years ago, Thakor, who holds his tenure and conducts research through the Johns Hopkins School of Medicine and teaches in the Whiting School of Engineering, began his Hopkins career working with the implantable defibrillator, or pacemaker, a now-standard cardiac device that was first developed and implanted in a patient at Hopkins. “Now the exciting new frontier is neuro and rehabilitation engineering” exclaims Thakor. “The idea is to bring technology to solve problems in an innovative manner and to advance science in application for problems in the brain sciences and neurobiological diseases and disorders. We are devising methods to diagnose brain disorders and injuries and developing implantable brain stimulators using brain signals to control prosthetic limbs. These are new territories and an exciting future awaits us.”

In June 2006, his team performed the first, successful demonstration of a brain-controlled prosthetic hand moving individual fingers. Their research is part of Revolutionizing Prosthetics 2009, a program sponsored by the Defense Advanced Research Projects Agency (DARPA) to create a neurally controlled upper-limb prosthetic ready for FDA approval and clinical trials by 2009. Last year, DARPA awarded Hopkins’ Applied Physics Lab (APL) $30.4 million as part of an international consortium of more than 10 organizations committed to bringing better prosthetics to market for people with limb loss as a result of accidents, disease, birth defects, and war.

Thakor oversees several sub-projects of the APL grant including: skin-like cosmesis; sensors for touch, force and temperature; prosthetic EEG control; and decoding neurons to control individual fingers and dexterous motions of the next-generation prosthetic hand. The Whiting School’s Ralph Etienne-Cummings, an associate professor in the Department of Electrical and Computer Engineering, consults on the central pattern generator (specialized neural circuits that produce rhythmic outputs to control motor systems), and Allison Okamura, an associate professor in Mechanical Engineering, provides the expertise on haptic feedback.

The Revolutionizing Prosthetics 2009 Program, managed by Stuart Harshbarger at APL, is testing its first limb system. Known as Proto 1, it was used in early clinical investigations with partners at the Rehabilitation Institute of Chicago. It is a significant step forward in naturally-controlled limbs and the perception of sensory interactions.

This summer, Thakor and his team will begin testing their prototypes with amputees. Vikram Aggarwal, a master’s student in Biomedical Engineering, finds it all a little humbling. “When you’re working, you can get lost in the details of the nitty-gritty of the neurons,” he remarks. “But in the end, this is not just advancing science, it’s improving someone’s quality of life.”

Thakor agrees. “While the challenges of interfacing to the nervous system and decoding its message are huge, the potential for making an impact is equally great. We have the knowledge and the technology is within our reach; we now have to make it work for the benefit of the amputees.”
In her Biomaterials and Tissue Engineering Lab in the Johns Hopkins Whitaker Biomedical Engineering Institute, she’s developing artificial cartilage for clinical applications, focusing on both form and function. Elisseeff is designing and manipulating a sophisticated synthetic scaffold to create cartilage that will bond better to the body’s natural cartilage and soft tissue. She notes that the current biomaterials used as artificial cartilage have a tendency to not stay in place. “Our research is a combination of applied and basic research,” she explains. “We look at how bone and cartilage talk with each other. They’ve always communicated with each other, but science hasn’t understood it.”

To create a better bonding cartilage, she examines adult and embryonic stem cells to see how they rebuild and form tissue. By creating multi-layered hydrogels to serve as scaffolds, Elisseeff and her team are able to mimic the complex, 3-D networks of musculoskeletal tissue—research that will lead directly to a better understanding of cell behavior and tissue regeneration. This first for the biomaterials field was published in *Nature Materials* in April.

All of this, she says, is leading to a ground-breaking end-goal: a minimally invasive, injectable chondral implant to be used mostly with knees. “It will be used for treating cartilage defects that can lead to arthritis later in life and as an arthritic treatment. Patients want to avoid metal and plastic implants. We’re trying to repair tissue with the same natural material that was lost.”

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In the Department of Electrical and Computer Engineering, Associate Professor Ralph Etienne-Cummings finds inspiration on the path less taken. As a pioneer in the field of neuromorphic engineering, he designs biologically inspired robotics that walk, run, and strut with grace and agility—very much a step in a different direction from the field’s standard of using strict mathematical and control theory to produce less natural robotic movements. “Biological systems have evolved over millions of years and hence should offer very efficient examples of what engineered systems can do,” says Etienne-Cummings. “No computer can remotely perform tasks routinely performed by some of the simplest living organisms.”

Etienne-Cummings’ research in sensory-motor integration has led him to examine such humble organisms as the lamprey eel and the housefly. Currently, the common cat is helping his Computational Sensory Motor Systems Lab create new pathways—and new hope—for the treatment of spinal cord injuries. In 2006, his lab, in collaboration with Vivian Mushahwar, of the Department of Biomedical Engineering and Center for Neuroscience at the University of Alberta, Edmondson in Canada, conducted the first-ever, successful experiment with an artificial neural circuit in the spinal cord in vivo.

To demonstrate that the silicon version could replace the biological version, they implanted electrodes in a paralyzed cat’s leg muscles. Sensors attached to the cat’s legs fed input to the CPG, which is no larger than a pencil eraser and was designed by Francesco Tenore, a Whiting School PhD student in Electrical Engineering. When activated, the CPG controlled the leg muscles, and the cat walked along a three-meter-long platform. Data reveals that the CPG-generated motor activation patterns are comparable to those produced by its biological counterpart.

For the cat, it may have been small steps. But it’s a giant leap for the growing field of neuromorphic engineering—and one of the first, critical steps in creating a neural prosthesis to restore movement. Spinal cord injuries disrupt the brain-to-muscle cord communication—and subsequent motor control—but the local circuits in the spine are generally left intact below the lesion. “We’ve replicated some of the biological circuits on the chip to create the signals that generate locomotion by direct communication with muscles,” Etienne-Cummings explains. “In the future, the chip will actually communicate with spinal cord’s natural neural circuits that communicate with the muscles.”

He estimates that a neural prosthetic for spinal cord patients is about a decade away. “There’s still a lot of work to be done, both at the spinal cord physiology/anatomy and artificial controls of these systems,” he explains. “We are developing the next version, an implantable chip that will seamlessly interface with the nervous system to record directly from the spinal cord, process the information, and stimulate the cord directly.”

“We’re extracting essential [biological] components and implementing them to reproduce functionality,” says R. Jacob Vogelstein, a Hopkins PhD student in Biomedical Engineering, who works on prosthetics in Etienne-Cummings’ lab. “It’s a very small miracle, except we know how the miracle works because we built it.”

Lamprey eels and horseflies provide biological inspiration for the treatment of spinal cord injury.
Objects of Admiration

“The human body,” says Pablo Iglesias, a professor in the Department of Electrical and Computer Engineering. “I know it’s not exactly engineered in the traditional sense, but by every other aspect, it’s the most impressive thing I can think of. But that may be cheating, and I certainly don’t ‘own’ it.” On further reflection, Iglesias, who grew up in South America, suggests that his house’s water supply system is the best-engineered object that he owns. “This is not very sexy, but having been to places where there’s not much running water, you realize how important it is,” he says. “It’s one of those things that you don’t think much about at all, which is a good hallmark of a well-engineered system.”

“My golf clubs,” says Edward M. Joffe, the project manager with the Whiting-Turner Contracting Company who is overseeing the construction of the Computational Science and Engineering building on the Homewood campus. “Recently I have been trying to play more than in years past,” he says. “I had been playing with a set of clubs that were handed down from my father, and I think that they were from the time of Arnold Palmer. Old clubs were made in a blade format and had a very small ‘sweet spot.’ That meant that you had to strike the ball with great accuracy in order to have a good shot. “Today’s clubs are a result of engineering and technological advances; they have larger sweet spots and are more forgiving. I am thankful for this engineering progress; it’s made the game a little less frustrating. Needless to say, I have gone from being a halfway decent golfer to a few-strokes-better golfer … but I’ll take it.”
We asked a sampling of faculty, students, and staff: What’s the best-engineered object you own?

By Elizabeth Evitts
Photos by Will Kirk ’99 (A&S)

Nikhil Ram Mohan, a rising junior studying applied math and statistics, believes that any well-engineered object should include thoughtful, simple technology. For that reason, this Dubai native picks his DeLonghi espresso maker: “It’s simple, it uses the basic ideas of pressure and heat—things that everyone understands—and it gives you a great cup of coffee in the morning.”

Erin Fitzgerald, a graduate student in the Department of Electrical and Computer Engineering and the founder and chair of Women of Whiting, a graduate student organization to support female students, says she values her tablet PC. The small laptop permits her to operate the computer with a digital pen or a fingertip instead of a keypad and a mouse. “A tablet PC is physically easily manipulated, the screen spins around; I can download papers and PDFs and write on those and store on the soft copy instead of having piles of papers around,” she says. Fitzgerald first started using a tablet PC when her faculty advisor, Frederick Jelinek, the director of the Center for Language and Speech Processing, sent her to work in Prague for a semester. “We thought that if we could write directly on the screen, it would help us work remotely,” she says. “We had Web cameras set up. I could directly draw on the tablet so as we spoke he would have the image appear on his screen.”

If you have a well-engineered object you’d like to tell us about, please send the information—and a photo if you like—to engineeringinfo@jhu.edu. We’ll post our readers’ responses on our website at engineering.jhu.edu/bestengineered.
Walter Krug has been an instrument designer for 33 years for the Department of Materials Science and Engineering. He had a tough time narrowing his list to just one object. “A few items have wowed me in my lifetime,” he says. “As a farm boy growing up in Pennsylvania I was subjected to many different machines. One of these machines was a corn sheller. It was very simple in construction and yet it would remove the kernels from the cob no matter the size or shape of the corn. The second device was a thing called a knotter, on a hay baler. I have studied it many, many times,” Krug says, “and can’t figure out how it works. But it does and quite well.”

In the end, the machinist’s top prize goes to his fishing reel. “Maybe the greatest engineered device I own is a fishing reel. In particular a spinning reel. If I consider all the things it must do—from being able to use it whether you’re right-handed or left, setting variable drag, casting and retrieving the line without it getting tangled, being submerged under water without damage, and being manufactured at a reasonable price—someone did a great job on this.”
Technological advances to a classic design impress Nicholas Jones, dean of the Whiting School.

“I love my new bike,” Jones says. “It’s great in its simplicity and how it hasn’t changed in more than a century. Yet it has evolved in detail. The high-end bikes these days are so superbly engineered in terms of what they contribute relative to their weight and how efficient they are.” On the weekends, he enjoys riding his Trek hybrid along the many trails near Baltimore.

Jones, who grew up in New Zealand, didn’t get a bike until he was 10—“which is probably a good thing,” he says, “because I grew up in quite a hilly region and I could have ended up in a pile at the bottom of a steep hill.” (The dean is making up for lost time—he estimates that he logged more than 3,000 miles on his last bike.)

Water is on the mind of Maya Sathyanadhan, an ’06 and ’07 graduate from the Department of Geography and Environmental Engineering. The president of the Executive Board of JHU’s chapter of Engineers Without Borders—USA, Sathyanadhan has traveled to places like South Africa to help supply water to remote villages. “I like my Nalgene bottle,” she says. “The product itself has had a lot of materials testing to it because it’s considered unbreakable. But the reason I like it is that it allows me to not use plastic bottles, but to reuse this one. I don’t own water, but the Nalgene product allows me to carry water without having to buy it.”
Back to the Classroom at Alumni College

“Our goal,” said Peter Searson, director of Johns Hopkins’ Institute for NanoBioTechnology (INBT), “is to establish Hopkins as the world leader in nanobiotechnology. Or, as I like to say, world domination.” The 40 or so alumni gathered in Hodson Hall appreciated Searson’s humor, especially at the beginning of an intensive, hourlong lecture on the characteristics of the very tiny things the INBT faculty researches.

Searson, who helped launch the INBT in 2006, was one of two Whiting School professors who hosted Alumni College during the Johns Hopkins Homecoming and Reunion in April. He and civil engineering professor Tony Dalrymple, who spoke on “Natural Hazards: Lessons Learned from the Tsunami and the Hurricane,” led independent sessions open to all alumni, during which they explained their research and the latest developments in their fields.

Mac McLeod ’57 and his wife, Lenore Danielson, who were visiting from their home in New Jersey, attended Searson’s morning lecture. “Professor Searson is one of the best lecturers I’ve heard,” McLeod commented. “It’s a fascinating field and he’s a fascinating teacher. It makes you feel like you’d like to go back to school and be in his class. It leaves you with a lot to think about, and it’s amazing to learn that the cost of solving the problems they’re working on is so high.” His wife interjected, “And to realize that the cost of not solving them is equally high.”

Searson’s presentation began with talk of size and scale. He explained that a “buckey ball”—a fundamental building component in the world of nanobiotechnology—is only a nanometer wide. By comparison, a single strand of a human hair is 100,000 nanometers wide. “We can make materials that are smaller than cells, which means that we can build things that can go into cells and deliver drugs,” he noted. He went on to discuss how nanobiotechnology engineers and scientists are searching for new therapies, new diagnostic tools, and a better understanding of the relationship between cells and disease.

While alumni from ages 30 to 90 listened intently, Searson continued on to explain the logistics of shrinking things to the nano scale, such as the discovery that when something gets smaller, a higher percentage of its atoms are on the surface. The result: Everything from fibers for athletic clothing that “wick away” liquid to drug delivery systems that target cancer cells.

Searson’s lecture ended with projections for what the future of nanobiotechnology holds in store for the world. “We will be able to take a ‘smart pill’ that will be programmed to report on its position and status in the body before releasing the correct dose of drugs,” he predicted.

Searson believes Johns Hopkins will be at the forefront of such discoveries, and he predicts we will see this technology hit the marketplace within decades.

—AR
A Rewarding Relationship

For John and Mary Zappone, both Whiting School alumni from the Class of ’86, Johns Hopkins will always be home.

The two met their freshman year. Mary was then a biomedical engineering major, but John soon lured her, subtly, he says, to his major: chemical engineering. Both excelled in the classroom and found time for extracurricular activities. Mary made the Dean’s List and competed on the varsity women’s diving team. John earned academic honors, served on Hopkins’ chapter of the American Institute for Chemical Engineers, and was house manager of Phi Kappa Psi.

The pair quickly developed a love of Baltimore and all things Hopkins: the Homewood campus, research, and, of course, lacrosse. The lacrosse fire still burns bright for John. He travels to as many Blue Jays games as he can and several years ago he created a national news site for the sport: www.laxnews.com.

After graduation, the couple got married while pursuing MBA degrees at the Columbia Business School. The Zappones then moved to Houston to take positions at Exxon Co.—he as a senior auditor, she as a total quality management team leader. The newlyweds might have been 1,400 miles from Baltimore, but Hopkins was not far from their thoughts.

They both became active in the Houston alumni chapter (John would later become president) and they began to donate to the university an amount tripled by their employer. They also began a nearly annual tradition of traveling back to Baltimore each spring for Homcoming and Reunion Weekend.

Says John of their Hopkins connection: “We love the place. We just always feel welcome here. It’s our home. It’s also a permanent reflection of us. For me, it opened up every door I ever wanted to be opened.”

John, who developed a passion for computers at Hopkins, worked his way up the corporate ladder with Exxon and then worked in sales for both Oracle and Siebel Systems. After serving as president of a real estate development company in Connecticut, he took a senior position with a major software firm based in Atlanta. Earlier this year, he became director of business development for Zensar Technologies, a global IT services provider.

Mary, who is now director of corporate strategic planning and analysis for Alcoa, previously held senior management positions with such heavyweights as McKinsey, General Electric, Exxon, and Tyco.

With a wealth of business knowledge to share, the Zappones are more than happy to pass some on to the next generation.

John has been a board member of the JHU New York Alumni Chapter since 2003. He is currently a member of the Society of Engineering Alumni (SEA) and Mary is a former member. For the past 15 years, Mary has served on the university’s National Alumni Schools Committee. In her role, she represents Hopkins at college fairs and receptions, interviews prospective students, and fields phone calls from current students and young alumni looking for advice.

What’s her sales pitch to prospective students?

“I tell them it’s a great school and a really nice size,” she says. “Hopkins is just small enough to be a tight community and a place where you can get to know the professors very well, if you reach out.”

She says it’s easy to volunteer when you feel so strongly about the university’s mission. “We enjoyed our time at Johns Hopkins a lot,” she says. “And we appreciate the training and education we received here, and we want to give back.”

She says it’s also been rewarding to donate money to the School of Engineering and general university fund. Each year, they return to the Homewood campus and marvel at Hopkins’ physical growth. “We can see that the money is well spent,” she observes. “In our own small way we know we are helping raise the prestige of our alma mater.”

The Zappones have three daughters, ages 10 to 14, who are all currently enrolled in Hopkins’ Center for Talented Youth, a program for academically advanced students. Any talk of where they want to go to college?

“Oh, they all want to go to Johns Hopkins,” Mary says with a laugh. “Well, it’s a school they know very well now, and they always hear us saying such great things about it, so it’s not so surprising.”

Mary recalls a moment last year when School of Engineering dean Nick Jones met the Zappones’ eldest daughter, Frances, while they were in Philadelphia. Jones later sent Frances a letter telling he looked forward to her enrolling at Johns Hopkins one day.

“She saved it,” Mary says. “I think she might take him up on it.” —GR
The Distinguished Alumnus Award
Established in 1978, this award honors alumni who have typified the Johns Hopkins tradition of excellence and brought credit to the university by their personal accomplishment, professional achievement, or humanitarian service.

Michael J. Zinner, MD
Distinguished Alumnus Award
Michael Zinner is a nationally known leader in surgery, medical education, research, and patient care. He is currently the surgeon-in-chief and chairman at Brigham and Women’s Hospital in Boston. The revised edition of his acclaimed text on abdominal surgery, Maingot’s Abdominal Operations, co-authored with Dr. Stanley Ashley Jr., was released in 2007.

Zinner earned his bachelor in engineering science in electrical engineering from Johns Hopkins in 1967 and in 1971 earned his MD from the University of Florida School of Medicine. After completing his internship and residency at Johns Hopkins Hospital, he served one year as the hospital’s assistant chief of service in the Department of Surgery.

Zinner has served as chief of surgery and chairman at UCLA, School of Medicine, vice chairman of surgery, and co-director of the Gastrointestinal Surgery Division at Johns Hopkins Hospital, and chief of general surgery and oncology service and co-director of the Surgical Intensive Care Unit at Kings County Hospital in Brooklyn, NY. Since 1994, he has held an appointment as the Mosely Professor of Surgery at Harvard Medical School.

Throughout his career, Zinner has found time to stay connected to Johns Hopkins. Most recently, he served on the committees of both his 35th and 40th reunions. He received a Johns Hopkins Distinguished Alumnus Award during Homecoming and Reunion Weekend in April 2007.

The Heritage Award
Established in 1973, this award honors alumni and friends of Johns Hopkins who have contributed outstanding service over an extended period to the progress of the university or the activities of the Alumni Association.

Charles W. Einolf
Heritage Award
Charles W. Einolf ’56 entered Hopkins’ McCoy College of Engineering as a night school student in 1946 following his discharge from the Army. He worked for IBM full time while at Hopkins and continued until he retired in 1984.

He was a member of the Alumni Council and the Society of Engineering Alumni and he attended alumni events on a regular basis when living in Atlanta and then in Baltimore. In 1982, Einolf and his wife, Dorothy, created the Otto and Hilda Einolf Scholarship Fund in memory of his parents. The scholarship, which supports full- or part-time students at the Whiting School, has funded the education of 26 students since its inception.

Sadly, Einolf died on February 23, 2007. With his passing, Johns Hopkins has lost an uncommonly loyal and talented member of the university community. The Johns Hopkins Heritage Award was presented to his wife and son at the Whiting School’s Leadership Dinner in June 2007.

The Woodrow Wilson Award
Established in 1990, this award for distinguished government service honors alumni who have brought credit to the university by their current or recently concluded public service as elected or appointed officials.

Aristides Melissaratos
Woodrow Wilson Award
Aristides Melissaratos earned his degree in Electrical Engineering from Johns Hopkins in 1966. In March 2007, he returned to Hopkins to serve as special advisor to the president for enterprise development. In this newly-created position, he oversees the university’s relationship with business and forges new connections between the research and corporate communities.

After graduating from Johns Hopkins, Melissaratos earned his master’s degree in engineering management from George Washington University and later completed the Harvard School Program for Management Development and the course work for a doctorate (ABD) in international politics at the Catholic University of America.

For 32 years, Melissaratos worked for Westinghouse Electronics Systems (now Northrop Grumman Electronics Systems). In 2003, Maryland Governor Robert Ehrlich appointed him Secretary of the Maryland Department of Business and Economic Development. Throughout his career, Melissaratos has held executive positions at many companies and has served as a member of economic development-related associations across the state.

In 1999, he established the Melissaratos Family Scholarship at Johns Hopkins to support undergraduate engineering students, with preference given to those from Baltimore City.
SEA 2007 Events

Sunday, July 22, 1 pm
**Atlanta Crab Feast**
University Yacht Club, on Lake Lanier, Georgia

Saturday, September 15, 2 pm
**Southeast Florida Crab Feast**
Riggins Crab House, Lantana, Florida

Wednesday, September 19, 6 pm
**Career Night** A networking event for alumni and students
Homewood Campus, Baltimore, Maryland

Saturday, October 6, 4 pm
**Houston Crab Feast**
The Ginger Man, Houston, Texas

Sunday, October 7, 4 pm
**North Texas Crab Feast**
The Ginger Man, Dallas, Texas

Friday, October 26, 4 pm
**Annual Fall Student and Alumni Mixer** A social gathering for students and alumni
Homewood Campus, Baltimore, Maryland

Wednesday, November 28, 6 pm
**Mock Interview Night** A great opportunity to assist students with their interviewing and networking skills
Homewood Campus, Baltimore, Maryland

*These events are co-sponsored with the Johns Hopkins Alumni Association Regional Chapters.

To register for any of the above events or for more information, please call the Whiting School’s Development and Alumni Relations Office at (410) 516-8723 or e-mail engineering@jhu.edu.

The SEA is your connection to a network of 30,000 other Johns Hopkins engineers worldwide.

There are many ways you can become involved with the SEA:

- Attend or sponsor a regional event in your area.
- Mentor a current student.
- Volunteer on an SEA committee.

Visit our Web site at engineering.jhu.edu/alumni-friends

Pictured here is the annual SEA Senior Send-Off Party and Reunion 2007. Congratulations to the Class of 2007 and to all classes who celebrated a reunion this year.
The course is called Advertising Promotions. The 18 undergraduates enrolled in it refer to themselves as the “Veritas Blue Advertising Agency” and go by titles such as “Manager of Public Relations” and “Finance Manager.” While the students must master key marketing concepts and market research skills, they also have to market a new mobile banking technology.

The class, taught by lecturer Leslie Kendrick and offered through the Whiting School’s Center for Leadership Education, competes with classes from five other colleges to create the most effective marketing communications plan promoting “Phire” technology. Phire, created by the real-life Sapphire Mobile Systems, enables mobile banking through your cell phone.

“The connection between engineering and business is just growing stronger at the Whiting School,” says Mark Presnell, director of the university’s Career Center. “Offering classes like this through the School of Engineering enables our students to take what they learn in their more technical classes and turn this knowledge into a marketable commodity in a variety of fields.”

Neeraj Bansal, senior vice president for Sapphire, had specific goals in mind when he asked students to develop a marketing strategy. “Advertising to college students on Facebook and Myspace is an obvious strategy,” he says. “We don’t need Johns Hopkins students to tell us that.” Instead, he says, he wanted them to identify a target market and determine how to market to that group.

In addition to developing a website, promoting across campus and to local business, and producing videos for Internet distribution, Veritas Blue secured television, radio, and print media publicity. And, on April 2, the students held a “Phire Fare” on campus, where they hosted a “Phire Hot Wing Eating Contest,” distributed flyers, and gave away logo-emblazoned ping-pong balls. One member of Veritas even dressed up as a cell phone.

On April 26, the students made their final presentation to Bansal. The group reported more than 830 unique visits to their website and more than 400 attendees at the Phire Fare. And while only 34 percent of the attendees would have been likely to use Phire before they attended the event, 82 percent said they’d be likely to do so after having learned more about it at the Phire Fare.

Ultimately, Veritas Blue reported that at the beginning of their campaign only 2 percent of the Hopkins population had heard of Phire, but by the end the student marketers had raised awareness campus-wide to 35 percent. —AR
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